UNIT CELL DIMENSIONS OF HYDRAZINE URANIUM (IV) FLOURIDE

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(*Received July* 19, 1968)

ABSTRACT. The Debye-scherrer powder pattern of hydrazine uranium (IV) flouride $N_2H_5UF_5$ was recorded by a Rigaku camera at room temperature. The powder data analysis shows the crystal to be orthorhombic with $a = 7.941$ AU, $b = 6.372$ AU and $c = 7.478$AU It contains 4 molecules per unit cell and the probable space group assigned to is P222 or Pmm2.

INTRODUCTION

Hydrazine uranium (IV) flouride is obtainable in microcrystalline form green in colour. As it is not possible to obtain large single crystals of this substance, the powder photograph is taken. We have followed the usual powder method analysis by Azaroff and Buerger (1958), D'eye and Wait (1960); Henry *et al*, (1951) to obtain the crystallographic data.

EXPERIMENTAL

The powder, contained in a capillary of Lindemann glass of 0.01mm. wall thickness and 0.5 mm diameter, was irradiated by filtered CuK_α ($\lambda = 1.54$ AU) radiation obtained from a Machlett A-2 X-ray diffraction tube operated at 30 KV and 20 mA The pattern was recorded on the film in 12 hours using a 9 cm diameter Rigaku Camera. The lines were measured accurately and the interplanar distances were calculated with highest accuracy. Attempts were made to fit this data to cubic, tegragonal and hexagonal systems and were in vain. Next Lipson's (1949) procedure was followed and a number of constant differences were found indicating the possibility that the crystal may be orthorhombic.

The values of $\sin^2\theta$ for the rings in the powder pattern are given in the table. Taking these values the difference diagram was drawn.

It was found that all the lines in the pattern can be indexed taking the values of $A = \lambda^2/4a^2 = 0.0094$, $B = \lambda^2/4b^2 = 0.0146$ and $C = \lambda^2/4c^2 = 0.0106$. The lattice parameters calculated from these constants are $a = 7.941$AU, $b = 6.372$ AU and $c = 7.478$ AU

The $\sin^2\theta$ values, indices, intensities and spacings are given in the table and the discrepancies between observed and calculated values are found to be within the permissible experimental error.

The density of the compound was found out to be 6.391 gm/cm^{-3} and the number of molecules per unit cell was found out to be 4. The calculated density comes out to be 6.4254 gm.cm^{-3} which is well within the observable limit.

The above results confirm the crystal to be orthorhombic. The study of indices shows the following conditions :

hkl, hol, hko, okl, hoo, oko, ool—no condition.

Therefore the probable space group is P222 or Pmm2.

Table 1

No. of lines	Intensity	Spacing 'd' observed	$\sin^2\theta$ Observed	$\sin^2\theta$ Calculated	Indices
1.	m	7.73109	0.0099	0.0094	100
2.	vvw	6.30316	0.0149	0.0146	010
3.	mm	4.14726	0.0345	0.0346	111
4.	vvw	3.94694	0.0381	0.0376	200
5.	vvw	3.49340	0.0486	0.0482	201
6.	vvw	3.19402	0.0581	0.0584	020
7.	vvw	2.74999	0.0784	0.0784	121
8.	vvw	2.65383	0.0842	0.0846	300
9.	vvw	2.49610	0.0952	0.0954	003
				0.0952	301
10.	vvw	2.32021	0.1101	0.1100	013
				0.1102	122
				0.1098	311
11.	m	2.22690	0.1196	0.1194	113
12.	vw	2.12604	0.1312	0.1314	030
13.	w	2.06600	0.1389	0.1384	222
14.	w	1.98421	0.1506	0.1504	400
				0.1514	131
15.	w	1.92552	0.1607	0.1610	401
16.	s	1.83768	0.1756	0.1756	411
17.	m	1.78751	0.1856	0.1854	322
18.	m	1.74372	0.1950	0.1946	313
19.	w	1.65810	0.2158	0.2160	330
20.	vw	1.59320	0.2340	0.2336	040
21.	vvw	1.55740	0.2437	0.2442	041
22.	vvw	1.50971	0.2602	0.2602	511
				0.2604	413
23.	s	1.46097	0.2654	0.2650	005
				0.2656	224
24.	s	1.43016	0.2894	0.2890	115
25.	vvw	1.40343	0.3010	0.3010	034
26.	s	1.37490	0.3136	0.3136	242
27.	vw	1.34695	0.3285	0.3288	341
				0.3290	043
28.	s	1.31019	0.3454	0.3450	513
29.	vw	1.27356	0.3655	0.3650	050
30.	w	1.20843	0.4060	0.4056	116
				0.4058	135
31.	vvw	1.19455	0.4155	0.4154	405
32.	vs	1.17926	0.4264	0.4264	442

ACKNOWLEDGMENTS

The authors express their sincere thanks to Dr. Balaram Sahoo, Dept. of Chemistry of I. I. T. Kharagpur for supplying the chemically pure substance for investigation

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